TODD,

Here's a schematic of the Hammarlund SP-210 and the color code sheet for the power supply.

Thanks again

Tom Clinton

Term		Voltage
1	YELLOW →	GND (FIL)
2	RED →	6.3 VAC
3	LT. PURPLE →	GND
4	GREY →	+110 V
5	PURPLE →	+275 V
6	ORANGE →	+360 V.
7	BROWN →	−53 V
8	BLACK →	} 110 VAC SUP.
9	WHITE →	

Tom Clinton AD4ML
3600 Ashley Estates
Marietta, GA 30067

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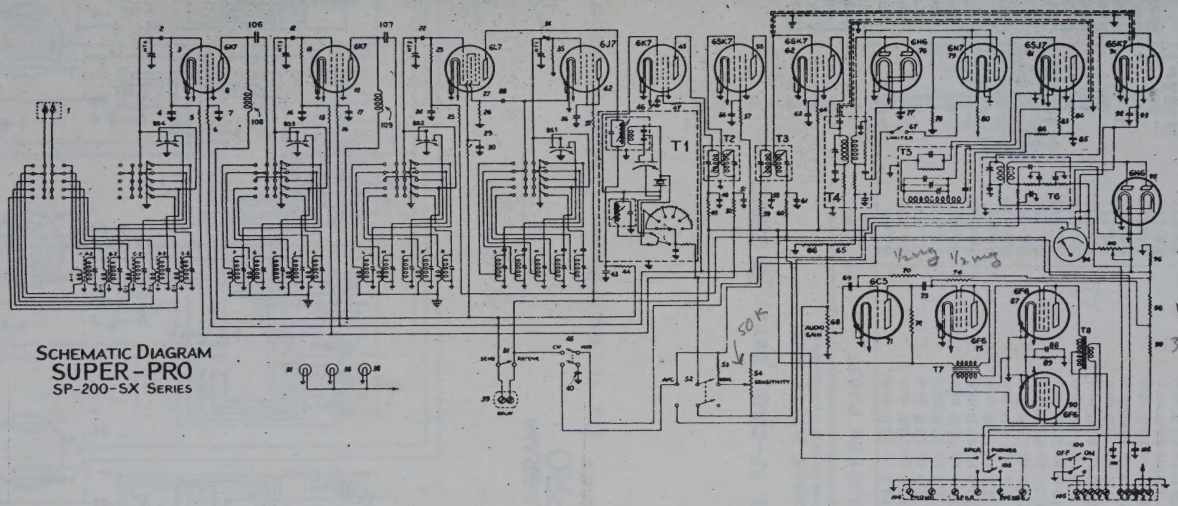
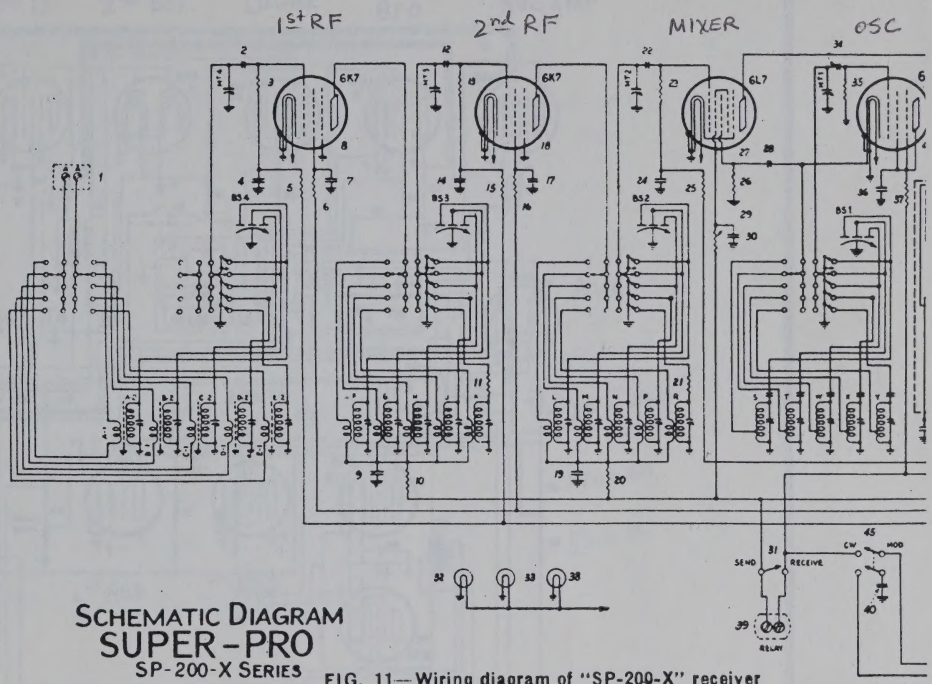


FIG. 11

A1	Antenna Input Coil Assembly	10.0 to 20.0 m.c.	T-7
A2	Antenna Output Coil Assembly	10.0 to 20.0 m.c.	T-8
B1	Antenna Input Coil Assembly	5.0 to 10.0 m.c.	1
B2	Antenna Output Coil Assembly	5.0 to 10.0 m.c.	2-12-22
C1	Antenna Input Coil Assembly	20.0 to 40.0 m.c.	28
C2	Antenna Output Coil Assembly	20.0 to 40.0 m.c.	34
D1	Antenna Input Coil Assembly	2.5 to 5.0 m.c.	77
D2	Antenna Output Coil Assembly	2.5 to 5.0 m.c.	69
E1	Antenna Input Coil Assembly	1250 to 2500 k.c.	4-14-24
E2	Antenna Output Coil Assembly	1250 to 2500 k.c.	7-17-30-36-
F	1st R.F. Coil Assembly	10.0 to 20.0 m.c.	43-46-48-51-
G	1st R.F. Coil Assembly	5.0 to 10.0 m.c.	56-58-61-63-
H	1st R.F. Coil Assembly	20.0 to 40.0 m.c.	73-85-92
J	1st R.F. Coil Assembly	2.5 to 5.0 m.c.	
K	1st R.F. Coil Assembly	1250 to 1160 k.c.	40-101-102
L	2nd R.F. Coil Assembly	10.0 to 20.0 m.c.	88
M	2nd R.F. Coil Assembly	5.0 to 10.0 m.c.	80
N	2nd R.F. Coil Assembly	20.0 to 40.0 m.c.	89
P	2nd R.F. Coil Assembly	2.5 to 5.0 m.c.	96
R	2nd R.F. Coil Assembly	1250 to 2500 k.c.	98
S	High Frequency Osc. Coil Assembly	10.0 to 20.0 m.c.	44-6-47-49-
T	High Frequency Osc. Coil Assembly	5.0 to 10.0 m.c.	57-59-16
W	High Frequency Osc. Coil Assembly	20.0 to 40.0 m.c.	99
X	High Frequency Osc. Coil Assembly	2.5 to 5.0 m.c.	86
Y	High Frequency Osc. Coil Assembly	1250 to 2500 k.c.	5-15-25-
T-1	Crystal filter assembly (465 kc.)		50-60
T-2, T-3	1st and 2nd, I.F. Transformer Coil Assembly		37
T-4	Detector plate coil assembly		29
T-5	Beat oscillator coil assembly		35-26
T-6	A.V.C. Plate coil assembly		66-84

Push-Pull Input Transformer		64-72-93
Push-Pull Output Transformer		65
Antenna terminal strip		78
Capacitor Fixed Mica	type 600 mmf.	3-13-23
Capacitor Fixed Silver	type 95 mmf.	70-74-83
Capacitor Fixed Silver	type 50 mmf.	53
Capacitor Fixed Mica	type 50 mmf.	8-18-45
Capacitor Fixed Tubular	type .02 mf. 500 V.	55-62-91
Capacitor Fixed Tubular	type .01 mf. 500 V.	76-95
Capacitor Fixed Tubular	type .05 mf. 500 V.	79 81 71 75-87-90
Capacitor Fixed Tubular	type .25 mf. 400 V.	27 42
Capacitor Dry Electrolytic	40 mf. 150 V.	32-33
Resistor	4 ohms wire wound 5 watt	38
Resistor	750 ohms wire wound 10 watt	94
Resistor	300 ohms metallized ½ watt	100
Resistor	1,700 ohms metallized ½ watt.	52-103
Resistor	2,000 ohms metallized ½ watt.	41 31
Resistor	3,000 ohms metallized 1 watt.	67
Resistor	5,000 ohms metallized ½ watt.	54 68
Resistor	10,000 ohms metallized ½ watt.	39 104
Resistor	12,000 ohms metallized 2 watt.	105
Resistor	25,000 ohms metallized 2 watt.	106-107
Resistor	25,000 ohms metallized ½ watt.	110
Resistor	50,000 ohms metallized 1 watt	
Resistor	75,000 ohms metallized ½ watt	
Resistor	250,000 ohms metallized ½ watt	
Resistor	250,000 ohms metallized ⅓ watt	
Resistor	500,000 ohms metallized ½ watt	
Resistor	2,000,000 ohms metallized ½ watt	
Tube socket 6K7		
Tube socket 6SK7		
Tube socket 6H6		
Tube socket 6N7		
Tube socket 6SJ7		
Tube socket 6C5		
Tube socket 6F6		
Tube socket 6L7		
Tube socket 6J7		
Dial lamps 6.3 volt .15 amp.		
Meter lamp 6.3 volt .15 amp. Bayonet type		
Tuning meter		
Off-on Switch		
AVC-MANUAL and SPEAKER-PHONES Switch		
CW-MOD Switch		
Send-Receive Switch		
Limiter switch		
Sensitivity control 50,000 ohm		
Audio Gain Control 250,000 ohm		
Relay terminal strip		
Phono-Speaker-Phones terminal strip		
Connecting terminal strip		
Capacitor Fixed Silver type 300 mmf.		
Meter adjusting potentiometer 1,000 W wire wound.		



SCHEMATIC DIAGRAM
SUPER-PRO
SP-200-X SERIES

FIG. 11—Wiring diagram of "SP-200-X" receiver

FOR OTHER DATA SEE THAT OF MODEL SP-200X, Early, IN INDEX

"SUPER-PRO" MODEL SP-200-SX PARTS LIST
(This parts list should be used to identify parts shown in the illustrations)

Schematic Designation	*DESCRIPTION — RECEIVER PARTS*	*Part No.*
A1	Antenna Input Coil Assembly 10.0 to 20.0 m.c.	SA-46
A2	Antenna Output Coil Assembly 10.0 to 20.0 m.c.	SA-110
B1	Antenna Input Coil Assembly 5.0 to 10.0 m.c.	SA-47
B2	Antenna Output Coil Assembly 5.0 to 10.0 m.c.	SA-113
C1	Antenna Input Coil Assembly 20.0 to 40.0 m.c.	SA-46
C2	Antenna Output Coil Assembly 20.0 to 40.0 m.c.	SA-130
D1	Antenna Input Coil Assembly 2.5 to 5.0 m.c.	SA-48
D2	Antenna Output Coil Assembly 2.5 to 5.0 m.c.	SA-116
E1	Antenna Input Coil Assembly 1250 to 2500 k.c.	SA-49
E2	Antenna Output Coil Assembly 1250 to 2500 k.c.	SA-136
F	1st R.F. Coil Assembly 10.0 to 20.0 m.c.	SA-111
G	1st R.F. Coil Assembly 5.0 to 10.0 m.c.	SA-114
H	1st R.F. Coil Assembly 20.0 to 40.0 m.c.	SA-131
J	1st R.F. Coil Assembly 2.5 to 5.0 m.c.	SA-117
K	1st R.F. Coil Assembly 1250 to 1160 k.c.	SA-137
L	2nd R.F. Coil Assembly 10.0 to 20.0 m.c.	SA-111
M	2nd R.F. Coil Assembly 5.0 to 10.0 m.c.	SA-114
N	2nd R.F. Coil Assembly 20.0 to 40.0 m.c.	SA-131
P	2nd R.F. Coil Assembly 2.5 to 5.0 m.c.	SA-117
R	2nd R.F. Coil Assembly 1250 to 2500 k.c.	SA-137
S	High Frequency Osc. Coil Assembly 10.0 to 20.0 m.c.	SA-112
T	High Frequency Osc. Coil Assembly 5.0 to 10.0 m.c.	SA-115
W	High Frequency Osc. Coil Assembly 20.0 to 40.0 m.c.	SA-132
X	High Frequency Osc. Coil Assembly 2.5 to 5.0 m.c.	SA-118
Y	High Frequency Osc. Coil Assembly 1250 to 2500 k.c.	SA-138
T-1	Crystal filter assembly (465 kc.)	SA-178
T-2, T-3	1st and 2nd, I.F. Transformer Coil Assembly	SA-166
T-4	Detector plate coil assembly	SA-167
T-5	Beat oscillator coil assem	
T-6	A.V.C. Plate coil assemb	
T-7	Push-Pull Input Transfo	
T-8	Push-Pull Output Transf	
1	Antenna terminal strip	
2-12-22	Capacitor Fixed Mica	
28	Capacitor Fixed Silver	
34	Capacitor Fixed Silver	
77	Capacitor Fixed Mica	
69	Capacitor Fixed Tubular	
4-14-24	Capacitor Fixed Tubular	
7-17-30-36-43-46-48-51-56-58-61-63-73-85-92	Capacitor Fixed Tubular	
40-101-102	Capacitor Fixed Tubular	
88	Capacitor Dry Electrolyt	
80	Resistor 4 ohms wire wo	
89	Resistor 750 ohms wire w	
11-21	Resistor 20 ohms wire wo	
96	Resistor 300 ohms metall	
98	Resistor 1,700 ohms	
10-20-44-6-47-49-57-59-16	Resistor 2,000 ohms	
99	Resistor 3,000 ohms	
86	Resistor 5,000 ohms	
5-15-25-50-60	Resistor 10,000 ohms	
37	Resistor 12,000 ohms	
29	Resistor 25,000 ohms	
35-26	Resistor 25,000 ohms	
66-84	Resistor 50,000 ohms	
64-72-93	Resistor 50,000 ohms	

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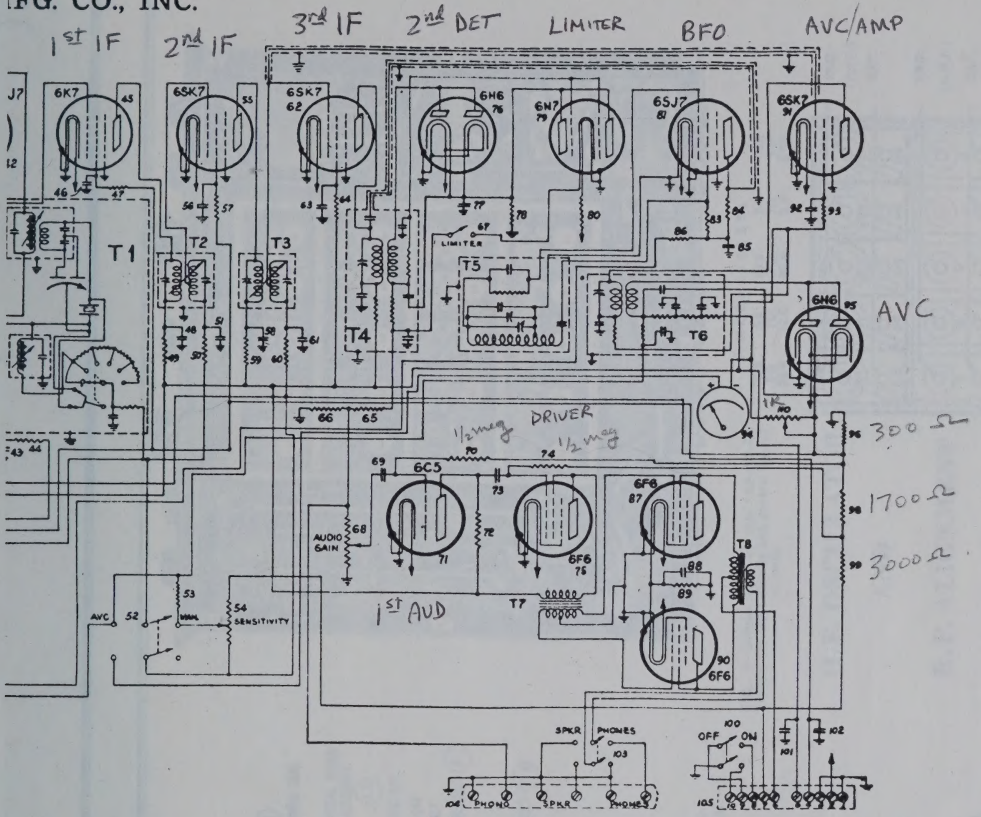
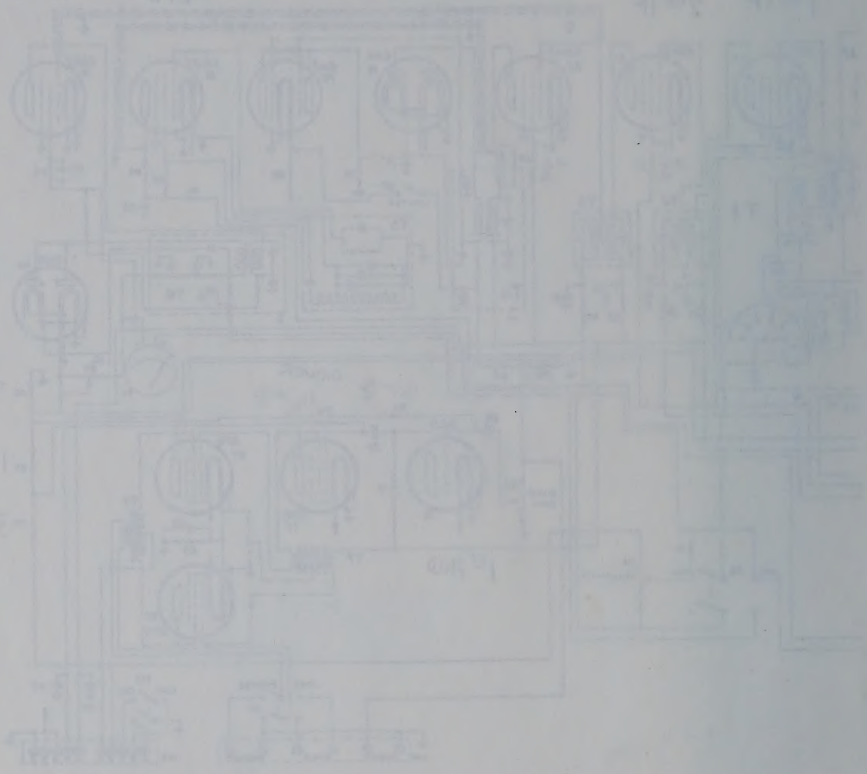


bly	SA-169	32-33	Dial lamps 6.3 volt .15 amp.	3920
ly	SA-168	38	Meter lamp 6.3 volt .15 amp. Bayonet type	6036
rmer	4827	94	Tuning meter	4903
ormer	4828	100	Off-on Switch	2983
	3842	52-103	AVC-MANUAL and SPEAKER-PHONES Switch	2990
type 600 mmf.	6073	41	CW-MOD Switch	4915
type 95 mmf.	6195	31	Send-Receive Switch	4917
type 50 mmf.	6074	67	Limiter switch	4916
type 50 mmf.	6199	54	Sensitivity control 50,000 ohm	4918
type .02 mf. 500 V.	6176	68	Audio Gain Control 250,000 ohm	4919
type .01 mf. 500 V.	6175	39	Relay terminal strip	4904
		104	Phono-Speaker-Phones terminal strip	4905
type .05 mf. 500 V.	6174	105	Connecting terminal strip	3838
		110	Meter adjusting potentiometer 1,000 W wire wound	4932
			POWER SUPPLY	
type .25 mf. 400 V.	3820	1	Power transformer 110 volts 60 cycle A.C.	4801
ic 40 mf. 150 V.	6171	2	Filter choke	2981
nd 5 watt	4921	3	A.C. input Cord and Plug	3900
round 10 watt	3836	4	Fuse Block for 2A. fuse	3859
und ½ watt	3987	5	Line Voltage Adjusting Strip	3858
ized ½ watt	6169	6	Speaker Field Terminal Strip	3840
metallized ½ watt	4947	7	Connecting Terminal Strip	3838
		8-9-10	Filter Condenser 16 mfd. electrolytic 450 volts	3832
metallized ½ watt	6160	11	Filter Condenser 8-8-8 mfd. electrolytic 450 volts	3834
		12	Resistor 18,000 ohms (2 taps)	3997
metallized 1 watt	3809	13	Resistor 18,000 ohms (1 tap)	4946
metallized ½ watt	4814	14	Tube socket 80	4807
		15	Tube socket 5Z3	3828
metallized ½ watt	6165	16	1 mf. paper filter condenser	4945
metallized 2 watt	4840	65	Resistor 75,000 ohms metallized ½ watt	4914
metallized 2 watt	3999	78	Resistor 250,000 ohms metallized ½ watt	4912
metallized ⅓ watt	4960	3-13-23	Resistor 250,000 ohms metallized ⅓ watt	4959
metallized ½ watt	6075	70-74-83	Resistor 500,000 ohms metallized ½ watt	6076
metallized 1 watt	6166	53	Resistor 2,000,000 ohms metallized ½ watt	4920



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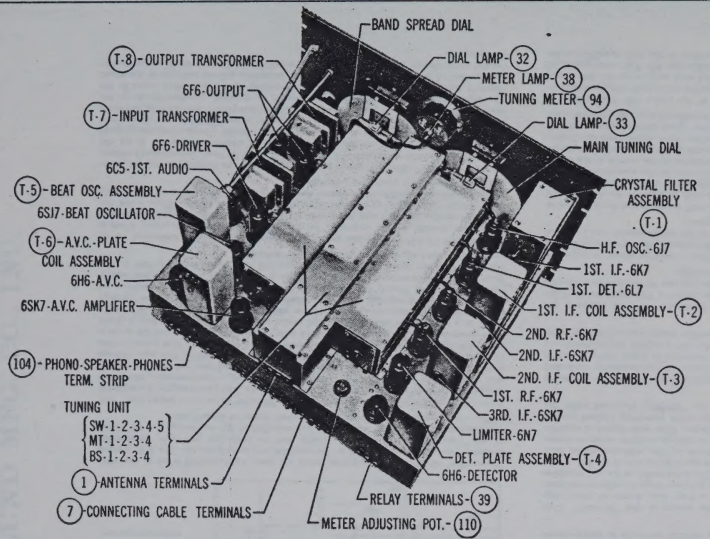


FIG. 7—Top view of "SP-200-X" receiver showing the general layout of parts. All important parts are labeled. Encircled numbers correspond to numbers appearing in the circuit diagram.

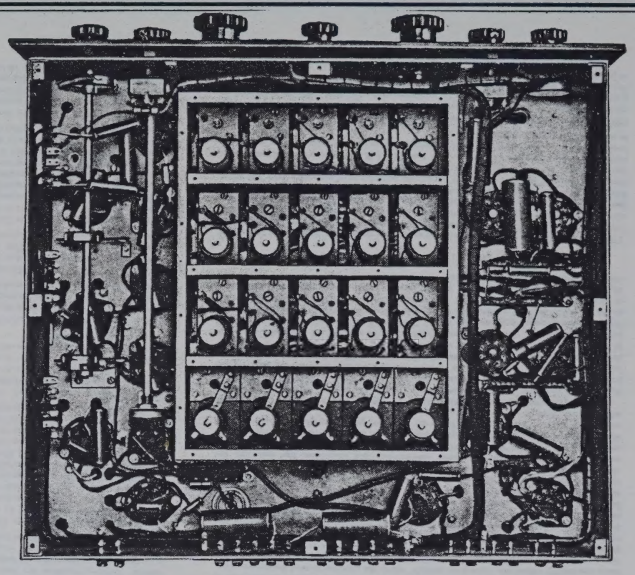


FIG. 9—Bottom view of the "SP-200-X" showing the coil assembly and general lay-out of parts.

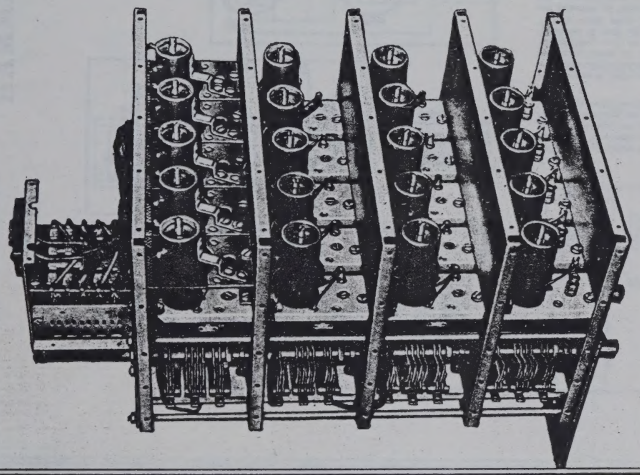
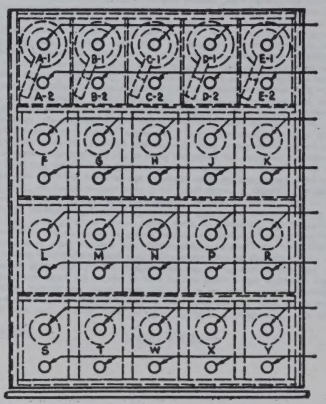


FIG. 10—Complete tuning unit used in all "Super-Pro" receivers. Includes all tuning condensers, coils, and band change switch. Each coil is mounted on an isolantite base with its associated trimmer condenser.

H.F. OSCILLATOR AND R.F. ALIGNMENT

(FOR OTHER DATA SEE INDEX)



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OPERATION

"SUPER-PRO" MODEL SP-200-SX

Although the "Super-Pro" is a highly technical piece of apparatus, with quite a large number of controls, it is relatively easy to operate. There are 15 controls on the panel. However, they are not all used at the same time. The number of controls necessary for operation will depend on the type of service for which the receiver is being used. The major controls are the band switch, main tuning, band spread, and audio gain. The remaining controls are brought into play as conditions demand their use. Assuming that the speaker, power supply and antenna have been connected according to instructions, the various controls should be set in the following positions: crystal selectivity, off; "phasing" on zero; "band width" on 6; "limiter," off; switch under the limiter control in "AVC" position; "sensitivity," maximum (10); band spread dial on 100; "signal" switch, on "modulation"; the toggle switch just beneath, should be set on "Speaker"; "audio gain" on 6; send-receive switch on "Rec."; beat oscillator on zero. Then, turn the main switch in the center of the panel marked "On-and-Off" to the on position. This puts the entire receiver in operation. The band switch should be adjusted to either the broadcast band or the next highest frequency band. This should permit reception of local stations and allow the operator to familiarize himself with various adjustments. The band width control should be adjusted to provide the most pleasing tone when there is no serious interference. Otherwise, it should be adjusted to the point providing best tone quality with a minimum of interference. The beat oscillator is turned on when the "signal" switch is in the "CW" position. The beat oscillator control varies the pitch of the heterodyne. This feature is used for code reception and for locating weak signals. The "limiter" control turns the noise limiter on and off. The noise limiter is most valuable on the shorter waves where automobile ignition interference is more serious. So far, we have considered the receiver adjustments necessary for phone reception. For code reception, the "AVC-Man." control should be set in the "Man." position and the sensitivity control turned down to provide proper sensitivity. On strong signals, this control should not be turned all the way on because there will be a tendency to overload the receiver. Volume is controlled with the "audio gain" control and not with the "sensitivity" control. The crystal filter is very effective and easy to operate because of its excellent stability. The first three positions are generally used for phone reception and will serve for code reception where interference is not severe. The last two positions are for code reception exclusively. When the crystal selectivity control is adjusted for optimum selectivity, the phasing control should be used to reject heterodyne interference or "whistle." The receiver can be temporarily silenced by turning the "Send-Receive" switch in the "Send" position. This allows the receiver to be ready for instant service and is more commonly called the "stand by switch" when the receiver is used for communication purposes. All tuning can be done with the main tuning control. In this case, the band spread dial is left at 100. The band spread dial operates so as to spread out a narrow band of frequencies in the neighborhood of the frequency at which the main dial is set. The band spread dial works continuously throughout the entire range of the receiver except on the lowest frequency bands. In this manner, many short wave broadcast or amateur bands can be spread out over the band spread dial for easy tuning. The wave ranges of the receiver are so arranged that when the band spread and main dial are set for 80 meter amateur band reception, the 40-meter band as well as the other amateur bands will appear on the band spread dial merely by turning the wave change switch. This is a great convenience and eliminates the necessity for searching each time for the amateur band which is to be covered by the band spread dial. For ear-phone operation, ear-phones are plugged into the terminal strip so marked on the rear of the chassis, and a switch on the front panel changes the receiver from ear-phone to loud speaker operation.

The next feature for consideration is the "S" Meter. This is used to judge relative signal levels and also as a tuning indicator. Maximum reading of the meter always indicates that the receiver is in exact tune with the station. The meter is calibrated in "S" units from 1 to 9, and the relative reading on any particular signal can be changed by re-setting the meter control adjustment which is located toward the rear of the chassis. The chassis drawing shows the position of this adjustment. A suggested method of adjusting the meter would be to tune in a signal of moderate strength. If you are accustomed to calling this signal "S-8" or "S-9," then adjust the meter control so that it indicates that value. This adjustable meter arrangement allows the operator to provide reports consistent with his usual system of reporting. No amount of explaining will teach the operator exactly how to control a receiver. Experience is absolutely necessary in order to obtain best results.

CIRCUIT ARRANGEMENT

TWO-STAGE T.R.F. AMPLIFIER: For maximum sensitivity, high image ratio, and low noise level, the "SP-200" has two stages of tuned radio frequency amplification ahead of the mixer stage. The antenna input circuit is electrostatically shielded from the grid circuit of the first tube. This permits the use of low impedance transmission lines between the antenna and the receiver with a minimum of noise pick-up. When lines or lead-ins of the two wire type having an impedance of approximately 100 ohms are employed, no matching transformer is necessary. The input impedance of the receiver is approximately 112 ohms. The two tuned R.F. stages are employed on all bands covered by the receiver. Both inductive and capacitive trimming are employed in all signal frequency circuits.

OSCILLATOR AND MIXER: Two separate tubes are employed in the oscillator and mixer stages to improve stability and prevent pulling. There is a very respectable gain in the mixer stage which tends to minimize any noise that may be generated in the rest of the receiver. In fact, the gain in this stage is so great that the noise contributed by the following stages is negligible.

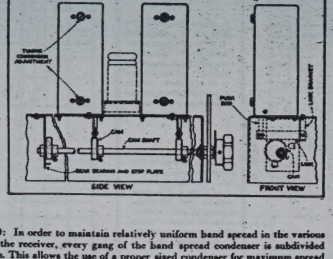


FIG. 1—Band width control which varies selectivity and permits the operator to adjust the receiver for best quality obtainable with minimum interference.

BAND SPREAD: In order to maintain relatively uniform band spread in the various tuning ranges of the receiver, every gang of the band spread condenser is subdivided into three sections. This allows the use of a proper sized condenser for maximum spread regardless of the position of the wave change switch. There are approximately 85 degrees spread for each of the important amateur bands, and there is also a corresponding spread over the other frequencies outside the amateur band.

CRYSTAL FILTER UNIT: The crystal filter used in the "Super-Pro" is an exclusive HAMMARLUND development and will be found only in HAMMARLUND receivers. This new filter has five ranges of selectivity varying from broad for phone reception, to knife-edge selectivity for single signal code reception. There are three positions for voice reception, and two for C.W. telegraph. The output of the filter is relatively constant over the entire selectivity range and has, therefore, little effect on "S" meter readings. Selectivity in the crystal filter circuit is not varied by detuning the load circuit. All circuits remain exactly in tune and selectivity is varied by changing the "Q" of the load circuit. This, together with the balanced phasing condenser, eliminates interlocking of controls and changes in filter gain when the selectivity is varied. Every precaution has been taken to effectively shield all circuits so that there is no feed-back or instability to impair the performance on even the highest frequencies. Stability is further insured by employing isolating resistor networks in every circuit that offers the slightest path for feed-back.

I.F. AMPLIFIER: There are three I.F. amplifier stages in the "SP-200." This elaborate amplifier is required in order to obtain a very high degree of selectivity. Special transformers are employed to hold down the gain per stage in order to maintain a high degree of selectivity and maximum stability. The band width of the I.F. amplifier is controlled by a cam arrangement which varies the coupling in two of the I.F. transformers. The I.F. channel is variable from 16 kc. down to 3 kc. with the crystal filter out of the circuit. The crystal filter, when in the circuit, is variable down to better than 100 cycles. Thus, full range selectivity is available. This wide degree of variable selectivity permits the operator to select the band width providing highest quality reproduction with a minimum of interference. In the "SP-200," the band width can be adjusted to suit operating conditions.

AVC SYSTEM: The automatic volume control system in the "SP-200" is extremely efficient. Both R.F. stages and the first two I.F. stages are automatically controlled by the incoming signal in order to compensate for variation in signal strength due to fading. This system is very fast in operation and will hold a rapidly fading signal to a relatively constant output. Special amplifier and rectifier stages are employed in order to obtain maximum efficiency.

BEAT FREQUENCY OSCILLATOR: The beat frequency oscillator circuit is designed to effectively heterodyne signals of various magnitudes. This oscillator is of the electron coupled type and is thoroughly isolated from the rest of the receiver. Careful selection of circuit values has resulted in excellent stability.

SECOND DETECTOR: A 6H6 connected in a half-wave rectifier circuit is employed for the second detector. The proper selection of circuit values in this circuit has resulted in a minimum of distortion. This circuit is more or less conventional and complete technical details are available by referring to the diagram.

NOISE LIMITER: The noise limiter in the "SP-200" is the latest development in audio peak limiting devices. It is designed to work with or without the AVC system and will follow variations in incoming signal strength. It is automatic and needs no adjustment. The limiter is designed to cut off interference of the automobile ignition nature at a point equal to approximately 100% modulation of the carrier of the signal being received. This provides for reception of 100% modulated signals without seriously affecting the quality of the voice or music. It must be remembered that this limiter will only limit interference of very short pulse duration. Such interference, as caused by auto ignition systems and similar disturbances will be reduced to a negligible quantity.

A.F. AMPLIFIER: The audio frequency channel of the series 200 "Super-Pro," is designed for high quality reproduction. The first stage is a 6C5 triode voltage amplifier. The second stage is a single 6F6 triode connected and used as a driver for the output amplifier which is a pair of 6F6's operated in push-pull, class AB. The rated output of this amplifier is approximately 14 watts. The fine quality of the A.F. amplifier in the "Super Pro" is particularly apparent when the band width control is set in the wide position. There is no tone control in this amplifier and none is needed. The A.F. portion of the "Super-Pro" will respond equally well to both low and high frequencies. Attenuation of the higher frequencies is accomplished by narrowing the I.F. band width. In this manner, the band width control serves to control tone.

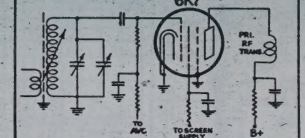


FIG. 2—Circuit diagram of first T.R.F. amplifier showing the electrostatic shield which reduces noise pickup.

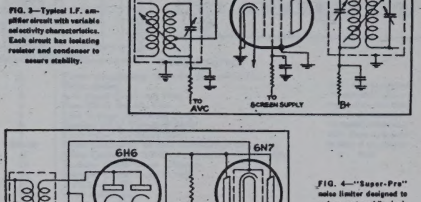


FIG. 3—Typical I.F. amplifier circuit with variable selectivity characteristics. Each circuit has isolating resistor and condenser to assure stability.

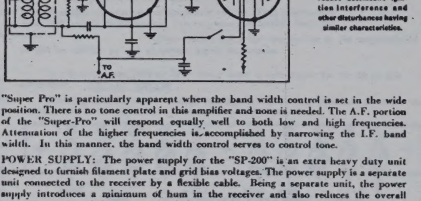
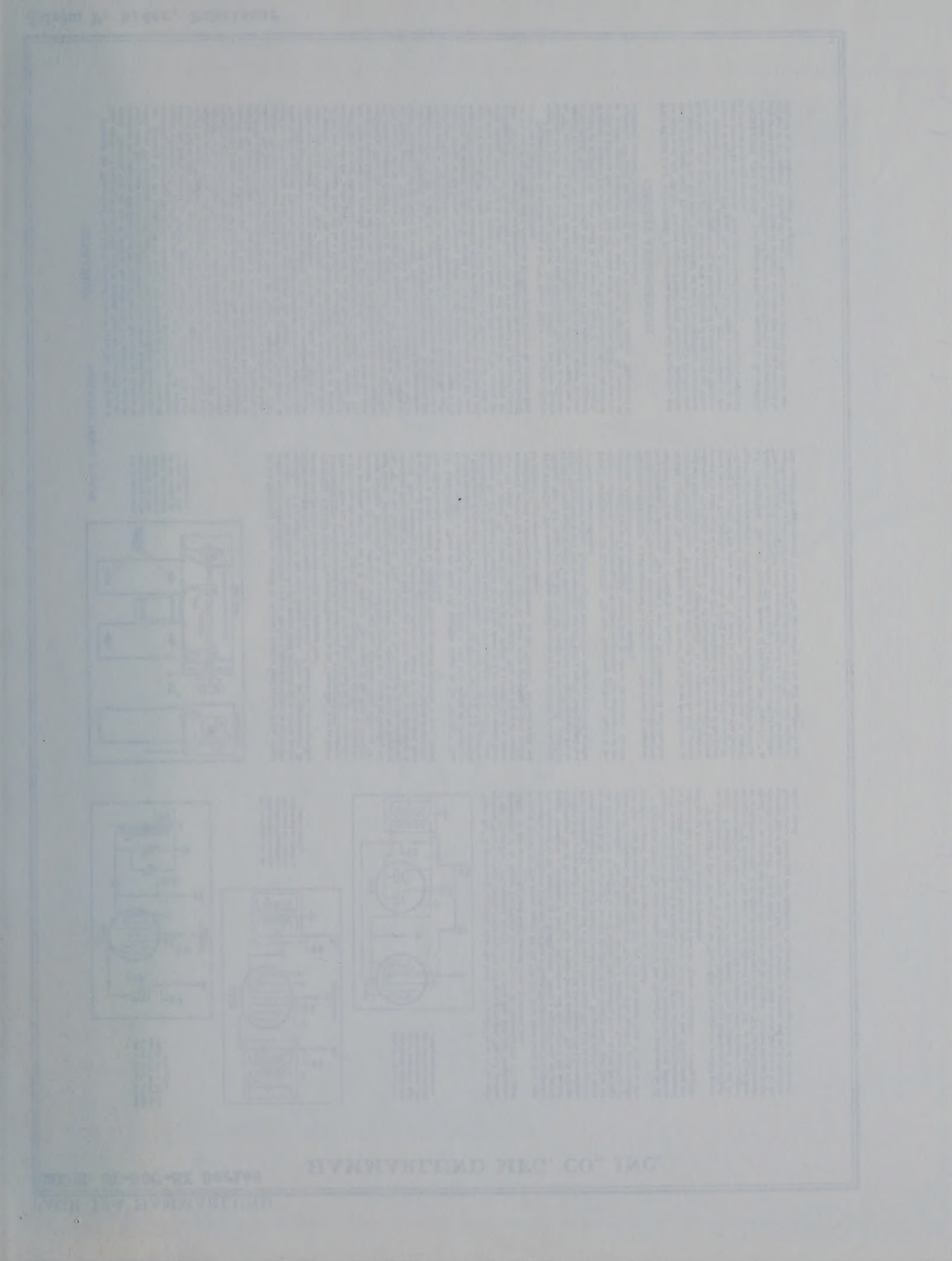


FIG. 4—"Super-Pro" noise limiter designed to reduce automobile ignition interference and other disturbances having similar characteristics.

POWER SUPPLY: The power supply for the "SP-200" is an extra heavy duty unit designed to furnish filament plate and grid bias voltages. The power supply is a separate unit connected to the receiver by a flexible cable. Being a separate unit, the power supply introduces a minimum of hum in the receiver and also reduces the overall temperature rise of the receiver, and thus permits better stability. The high voltage rectifier in the power supply is a 5Z3 connected in a full wave circuit with a two-section filter consisting of 32 mf. capacity and a 15 henry filter choke. The field of the speaker serves as a second filter choke in standard model receivers. In special models, a choke is mounted in the power supply to take the place of the speaker field. Grid bias for the entire receiver is supplied by an 80 rectifier tube operating from a tap on the high voltage secondary. The C-Bias supply also has a multi-section filter consisting of three 8 mf. condensers, and three resistors. The primary of the standard power supply has three taps for operation on 105, 115, and 125 volt power lines. A fuse is also provided to guard against damage in cases of overload.

CALIBRATION: The main tuning dial of the "Super-Pro" is calibrated for all frequencies covered by the receiver. In the process of manufacture, every effort is made to maintain accuracy and, as a result, the accuracy of the calibration is guaranteed to be within ½ of 1% of the highest frequency of the band in use. When using the calibrated dial, it should be remembered that the figures are intended as a tuning guide and not for frequency measuring purposes.

"S" METER": The "S" meter in the "Super-Pro" was designed to provide greatest satisfaction to the operator. It is, in no way, limited by fixed, factory-made adjustments. A variable control on the rear of the chassis allows the operator to set the maximum reading of the meter to conform with his particular system of reporting signal strength in "S" numbers. The meter can be adjusted to read "S-9" on any signal from 10 to 10,000 microvolts. It is adjusted at the factory to indicate "S-9" on a 25 microvolt signal, but as pointed out above, this can readily be changed. Another feature is the centrally located scale. This is much more convenient than a scale that starts at the extreme left of the meter dial, and brings the indicating pointer well out in the clear. Special meter design has also eliminated the possibility of damage due to an extremely strong signal.



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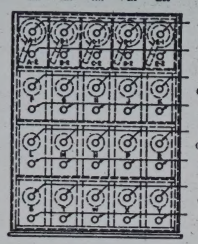
H.F. OSCILLATOR AND R.F. ALIGNMENT

Connect the output of the test oscillator to the "A.A." terminal strip. Connect the output meter to the speaker voice coil terminals. The controls on the front panel should be set as follows:

(1) Band Change Switch on 540–1160 K.C. (2) Main Tuning Dial on 1100 K.C. (3) Band Spread Dial on 100. (4) Sensitivity Control "To Produce appropriate output meter reading." (5) Audio Gain Control "Full On." (6) C.W.-MOD switch on "MOD." (7) A.V.C.-MANUAL Switch on "MANUAL." (8) SEND-RECEIVE Switch on "RECEIVE." (9) "Phones-Speaker" Switch on "PHONES."

Turn the receiver over, bottom side up, placing a small block of wood under the rear of the switch section to protect the shield cans and tubes. The main tuning unit bottom plate should remain in place while H.F. oscillator and R.F. adjustments are being made. In order to facilitate the alignment of these stages, we have indicated in dotted lines, the coil positions beneath the bottom cover plate, together with all-capacity and inductance adjusters. Capacity adjusting condensers are located on the coil bases and inductance adjusters extend through the top of each coil. The coil markings correspond to the designations on the schematic wiring diagram. Set the test oscillator to produce a 2.5 MC. signal. Adjust the trimmer capacitor "Y" until a peak reading is obtained in the output meter. Now set the main tuning condenser dial to 1.26 MC. and adjust the test oscillator for a 1.26 MC. signal. Turn the inductance adjustment on coil "Y" for a peak reading on the output meter. As these two adjustments react on each other it will be necessary to repeat them until no further change in either capacity or inductance is necessary. This realignment should only be done after making sure that the calibration of main dial is incorrect.



Turn the main tuning dial to 2.5 MC. and set the test oscillator for 2.5 MC. signal. Adjust each capacitor on coil "R"-"K"-"E2" in the order named, for peak reading on the output meter. The Sensitivity control should be adjusted so that no overloading occurs and an appropriate reading on the output meter is maintained. Now set the main tuning dial at 1.26 MC. and the test oscillator on the same frequency and turn the "inductance adjustments" on coil "R"-"K"-E1" for peak reading on the output meter. These adjustments are also interlocking and should be repeated until no further improvement can be noticed. This completes the H.F. Oscillator and R.F. coil alignment for the frequency range of 1.25 to 2.50 MC.

The alignment procedure of the H.F. Oscillator and R.F. coils in the remaining frequency ranges is exactly the same as outlined for the 1.25-2.50 MC. band. Test oscillator frequencies and main tuning dial settings vary as follows:

Range	*Capacity Frequency*	*Condensers*	*Inductance Frequency*	*Coils*
1.25 to 2.50 MC.	2.5 MC.	Y-R-K-E2	1.26 MC.	Y-R-K-E1
2.5 to 5.0 MC.	5.0 MC.	X-P-J-D2	2.5 MC.	X-P-J-D1
20.0 to 40.0 MC.	40 MC.	W-N-H-C2	20 MC.	W-N-H-C1
5.0 to 10.0 MC.	10.0 M.C.	T-M-G-B2	5.0 M.C.	T-M-G-B1
10.0 to 20.0 MC.	20.0 M.C.	S-L-F-A2	10.0 M.C.	S-L-F-A1

I. F. ALIGNMENT

The following adjustments should only be attempted after making *certain* that the I.F. channel of the receiver is out of alignment.

The alignment of the I.F. amplifier may be checked as follows: Connect a low reading (1 volt) output meter across the voice coil terminals. Connect a test oscillator (modulated at 400 cycles or less) to the antenna terminals of the receiver. Set the crystal selectivity switch on Number 1, the phasing control on the arrow, and the band-width control at 3. With the AVC-MANUAL switch on "manual" and the A.F. gain at 10, adjust the sensitivity control for an output meter reading of approximately 1 volt, with the test signal tuned accurately. Now, check the settings of the I.F. tuning condenser on T-2, T-3, and T-4 (*DO NOT DISTURB* the screw tuning adjustments of the Crystal Filter T-1). Then reduce the A.F. gain to protect the output meter and throw the AVC-MANUAL to "AVC" and turn the sensitivity control to 10. Then adjust T-6 for maximum "S" meter reading. This can be done most satisfactorily by adjusting the input from the test oscillator to produce an "S" reading of approximately 8.

To check the alignment of the Crystal Filter T-1, an oscillograph and sweep frequency oscillator are required. First adjust the sweep frequency oscillator to exact agreement with the crystal resonant frequency with the Crystal Selectivity switch on Number 5, and the phasing control on the arrow. Then, set the switch on Number 1 and adjust the lower screw on T-1 for maximum height, and the upper screw for symmetry of oscillograph image.

SELECTIVITY

The selectivity curves shown on page are representative curves made on a sample receiver and will hold reasonably true for all models. These curves were taken with the signal generator operating at the intermediate frequency and these curves will maintain throughout the entire range of the receiver, except at the very low frequency end of the broadcast band where the R.F. selectivity has a very slight narrowing effect. The selectivity of the "Super-Pro" is divided into two distinct ranges. In Fig. 5, appear the wide band curves. These curves were made at 4 different positions of the band width control. However, the actual selectivity obtainable is continuously variable between curves 3 and 16. Particular attention should be paid to the steepness of the sides of these curves. They are relatively straight and do not have the usual flare at the outer limits. This means that there will be less background interference from stations operating either higher or lower in frequency than the station being received. The advantage of having continuously variable selectivity over relatively wide limits in a receiver is readily apparent when one considers that the operator has absolute control and can adjust the receiver to compensate for almost any degree of interference that may be present. For example, when interference is not serious, the band width control can be set to the widest position and permit high quality reproduction of either voice or music. In other cases where interference is present, the band width control can be adjusted to the point where selectivity is just sufficient to eliminate interference. This adjustment provides maximum fidelity with a minimum of interference. It also permits the operator to utilize the extreme sensitivity of the "Super-Pro." Even in crowded bands, the selectivity can be adjusted to a point where interference is not bothersome and the sensitivity can be turned up to provide reception of extremely weak signals with marked clarity.

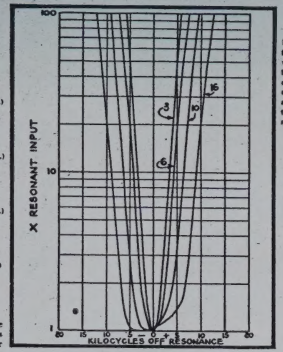


FIG. 5—I.F. curves taken at four positions of the band width control. The actual selectivity of the I.F. amplifier is continuously variable between curves 3 and 16. Particular attention should be paid to the sharp cut-off which greatly reduces back-ground interference.

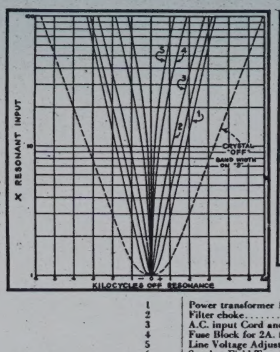


FIG. 6—Variable crystal filter selectivity curves showing five positions of the control switch. Positions 1, 2 and 3 are intended for voice reception. Position 1 is broad enough to permit reception of music. Positions 4 and 5 are for single signal code reception.

In Fig. 6, the variable selectivity crystal filter curves are illustrated. It will be noticed that the crystal filter fills in the gap very nicely between position "3" of the band width control and what would normally be maximum crystal selectivity for code reception. This variable selectivity crystal filter is an exclusive HAMMARLUND development and will be found only in a HAMMARLUND receiver. The crystal filter has five ranges of selectivity. The first three are intended for phone reception. The widest position of these, however, will permit good quality music under conditions where interference would, in most cases, make reception impossible. Positions four and five are for CW code reception and provide the usual single signal response.

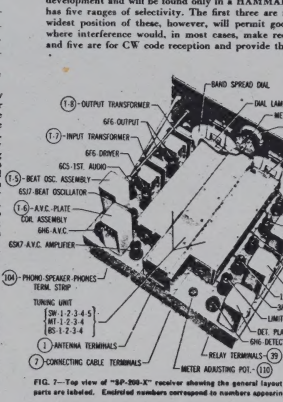


FIG. 7—Top view of "SP-200-X" receiver showing the general layout of parts. All important parts are labeled. Encircled numbers correspond to numbers appearing in the circuit diagram.

*2500
*4001
*2500
*2002
*2002
*2002
*5000
*5000
*5000

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The "Super-Pro" is available to cover several frequency ranges. Such information as is given will pertain to all models. The two standard models have the following tuning ranges:

SP-200	SP-200-S
540 – 1160 kc.	1250 – 2500 kc.
1160 – 2500 kc.	2.5 – 5 mc.
2.5 – 5 mc.	5 – 10 mc.
5 – 10 mc.	10 – 20 mc.
10 – 20 mc.	20 – 40 mc.

The sensitivity of the new "Super-Pro" is truly remarkable. By careful circuit design, the overall set noise has been held down to a minimum, thus making it possible to receive extremely weak signals with favorable signal-to-noise ratio. The variable selectivity feature of the "Super-Pro" permits the operator to make full use of the extreme sensitivity even under most severe conditions of interference. Selectivity can be adjusted to cut down interference within very close limits. The advantages of variable selectivity are tremendous when one considers that conditions of interference are not always the same. Under certain conditions, it may be possible to use quite a wide band width and thus enjoy improved tone, as well as easier tuning. Under other conditions, where interference is quite bad, the band width can be narrowed just enough to eliminate interference and in that case, the best possible fidelity that can be obtained without too much interference, is available. In a case where there is practically no interference from other stations, the band width can be adjusted to its widest point and high fidelity reception can be enjoyed.

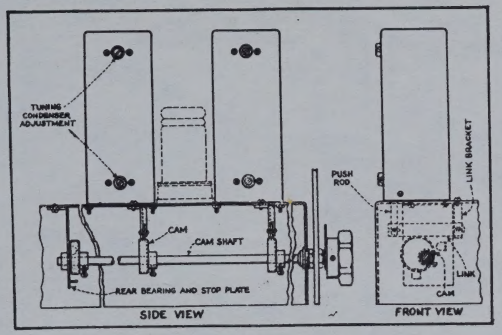


FIG. 1—Band width control which varies selectivity and permits the operator to adjust the receiver for best quality obtainable with minimum interference.

TUBE LINE-UP

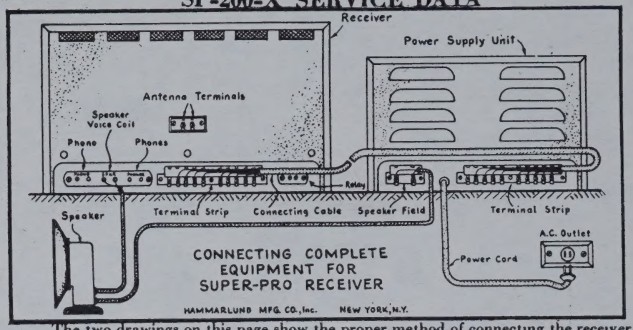
6K7 — First tuned R.F.	6N7 — Noise limiter
6K7 — Second tuned R.F.	6SK7 — AVC driver
6L7 — Mixer	6H6 — AVC Diode
6J7 — H.F. Oscillator	6SJ7 — B.F. Oscillator
6K7 — First I.F. Amplifier	6C5 — First A.F. Amplifier
6SK7 — Second I.F. Amplifier	6F6 — Second A.F. Amplifier
6SK7 — Third I.F. Amplifier	2-6F6 — Third A.F. Amplifier (Push-Pull)
6H6 — Second Detector	5Z3 — High Voltage Rectifier

80 — C-Bias Rectifier

ANTENNA REQUIREMENTS

The input of the Series 200 "Super-Pro" is approximately 112 ohms. This means that for best results, the antenna should be coupled to the receiver by means of a low impedance transmission line. The doublet type antenna produces best results. Any well-known low impedance lead-in cable can be used with satisfaction. The use of low impedance lead-ins provides less chance for the lead-in itself to pick up extraneous noises. The low impedance lead-in, together with the electrostatic shield built into the antenna coil of the receiver, reduces noise to a minimum. It must be remembered that every antenna has a period of resonance and works best at that frequency. When erecting a doublet antenna, it is advisable to arrange its physical dimensions so that it will resonate in the band of frequencies where most sensitivity is desired. Care taken in designing and erecting an antenna will pay for itself many times in superior results.

SP-200-X SERVICE DATA



The two drawings on this page show the proper method of connecting the receiver, power supply, and speaker together. The drawing above shows a standard installation, while the diagram below indicates receiver connections when batteries furnish the power. Protective covers are furnished for all important terminal strips and they should always be in place.